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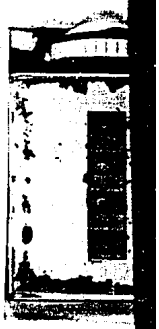

SOVIET ACTIVITIES IN THE ARCTIC AND ANTARCTIC (5)

[Comment: Soviet Activities in the Arctic and Antarctic is a bimonthly report presenting information extracted from Soviet newspapers, periodicals, and books. This report includes information published up to 21 July 1956.

The report covers all Soviet activities in the Artic and Antarctic with the exception of commercial shipping, which appears in the Summary series Transportation, Communications, Electric Power, and Construction in the USSR.

All temperatures in this report are given in degrees centigrade. Numbers in parentheses refer to appended sources.]

ARCTIC

Soviet Delegation to Stockholm Conference

The Soviet delegation to the Stockholm conference on the IGY (International Geophysical Year) in the Arctic was headed by V. V. Belousov and included representatives from the institutes of the Academy of Sciences USSR, the Main Administration of the Hydrometeorological Service, and the Main Administration of the Northern Sea Route (Glavsevmorput').

In writing a press article on the Stockholm conference, V. F. Burkhanov (a delegate) made the following statements on American activities:

"In addition to significant work in Alaska, American scientists will operate two scientific stations on drifting ice north of the Canadian Arctic Archipelago. Members of the American delegation informed the conference that they would consult with Soviet scientists on location of the camps and methods for establishing them in order to benefit from Soviet experience in this type of activity. American polar workers expressed the desire to maintain close scientific contact between workers of the American and Soviet drift stations and to organize direct aircraft and radio communications between them."(1)

Drift Stations

In April 1955, Gordiyenko and his staff took over Severnyy Polyus-4 at 80-39 N and 176-06 W, relieving Tolstikov and his personnel, who had manned the station for a year. On 7 April 1956, a third staff relieved at Severnyy Polyus-4, and on this date the station was located at 87-38 N and 170-04 W.

During the drift year 1955-1956, the station drifted almost 770 kilometers to the north, and counting its entire irregular course, it traveled about 2,500 kilometers.

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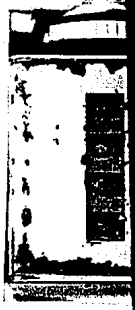

A great deal of scientific work was accomplished at Severnyy Polyus-4 during the year, including a full oceanographic program carried out by M. Nikitin, N. Telyayev, and V. Shil'nikov. In addition to the usual deep-water and ice measurement instruments, the group used many new techniques and types of equipment, including the Telyayev bifilar current measurement system, a heavy deep-water trawl permitting bottom trawls, a self-recording drift recorder for determination of the station's movement, and bottom core pipes of increased dimensions.

During the drift year 1955-1956, 21 deep-water hydrologic stations were taken and the same number of hydrobiologic stations. Ocean depths were sounded by lead 334 times, with measurements ranging from 1,800 to 4,000 meters. Among 20 bottom cores obtained, some were 120 centimeters long.

Self-recording current indicators, located at various ocean depths, operated more than 52,000 hours during the year, and over 900 chemical analyses were made on sea water samples.

Temperature and salinity data gathered at the station have been used for studies on distribution of Pacific Ocean water entering the polar basin through the Bering Strait.

An analysis of the soundings taken indicates that the eastern part of the Arctic Ocean (that part lying to the east of the range imeni Lomonosov) is a region cut by submarine mountain ranges divided by steeply sloped troughs.

Two basic regions can be outlined in the area through which Severnyy Polyus-4 drifted in 1955 and 1956. The first, located between the 80th and 86th parallels, has an extremely broken relief with sharp increases and decreases in bottom level. The depth in this region is between 1,800 and 3,500 meters. To the north of the 86th parallel, there is a deep water depression with an amazingly level bottom. Depths there are between 3,950 and 4,000 meters.

Biological samples gathered at Severnyy Polyus-4 show that even in conditions of total darkness, existing at the 1,000 meter and greater depths, small floating organisms do exist. These organisms are especially numerous in the layer of Atlantic Ocean water which is at a depth of 800-900 meters and separates the surface and deep layers of local water.

A great deal of work was done during the year on atmospheric research by the aerological group which included S. Gaygerov, P. Dunayev, and G. Dolganov, aided by radio-theodolite technicians Yu. Morozov and I. Gorev. During the drift year, this group launched about 800 radiosondes with an average ascent of more than 20 kilometers.

Research was carried out not only on the troposphere and lower layers of the atmosphere, but on the stratosphere as well. Work done by S. Gaygerov during the drift has shed considerable light on the influence exerted by high-altitude processes in the formation of weather on the earth's surface. Seasonal changes in temperatures at various levels were established also. It was found, for example, that in the lower layers of the stratosphere temperatures of minus 80 degrees and even lower may be encountered during the long winter night.

With the advent of spring, the lower layers of the stratosphere are heated by solar radiation, the air warming to 34-39 degrees.

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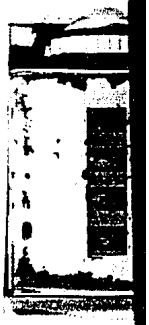

In April, aerologists at the station launched a radiosonde which reached an altitude of 33,100 meters, and 2 days later this record was broken when another radiosonde reached 35,400 meters.

Meteorologists G. Khlopushin and B. Rozhkov took readings and made observations with their many instruments eight times a day ordinarily and every hour on days of aircraft flights.

Magnetologist N. Chernigovskiy and meteorologist G. Khlopushin carried out complex observations on the radiation of solar energy at the ice surface and its penetration into the ice, snow, and under-ice water layer.

One of the eldest Soviet polar workers, geophysicist A. Teologov, worked at the station during the year in three different disciplines -- astronomy, magnetology, and seismography.

Radio operators F. Zakhar'in and L. Bogdanov maintained uninterrupted radio communications with the mainland, while the helicopter crew, including N. Makarov, P. Pimenov, V. Yemel'yanov, and A. Suvorov, completed several hundred flights for both scientific and transport purposes. Mechanics M. Katin, A. Makarov, and A. Shutyayev and cook Ts. Khorzhanovskiy were all extremely important to the work of the camp.

On the basis of the drift of Severnyy Polyus-3 and Severnyy Polyus-4 in 1954 and 1955 and the drift of Severnyy Polyus-4 and Severnyy Polyus-5 in 1955 and 1956, a forecast has been formulated on ice conditions during the approaching summer in the Chukchi and East Siberian seas.(2)

The staff now at Severnyy Polyus-4 (the third staff to man the station) is headed by Aleksandr Gavrilovich Dralkin, who entered the Arctic for the first time 20 years ago when he was a student at the hydrometeorological institute. Receiving his diploma as engineer-oceanographer in 1938, he began work at one of the polar stations. He has since taken part in many high-latitude expeditions, including work at Severnyy Polyus-4 in 1954 and 1955. His oceanographic work during this drift has been highly praised.

Oceanographer M. V. Izvekov and mechanic A. I. Shutyayev are also back at Severnyy Polyus-4, where they worked in 1954 and 1955.

I. G. Petrov, ice research specialist, is now working on a drift station for the second time also. In 1950 and 1951 he took part in the work of the station Severnyy Polyus-2. He recently completed his dissertation and was awarded the degree of Candidate of Geographical Sciences.

The new staff also included aerologist M. M. Korolev and radioman V. S. Sidorov, students at the Leningrad Arctic School. They have both worked at polar stations since 1948.

On 3 April, the station Severnyy Polyus-5 was located at 86-27 N and 87-20 E, some 780 kilometers northwest of the point where it began its drift.(3)

The 1955-1956 staff has been relieved at this station also, and has been replaced by a small staff which will operate the camp until it is abandoned. The new group is composed of just five scientific workers, including the young scientist Anatoliy Leont'yevich Sokolov, station chief; I. Sharikov and G. Silin, meteorologists; L. Zhigalov, astronomer (Leningrad State University student), and radio operator P. Sorokin. This staff is carrying out oceanographic, meteorologic, and geomagnetic work, using the instruments left by the former staff and new equipment produced by the shops of the Arctic Institute.(4)

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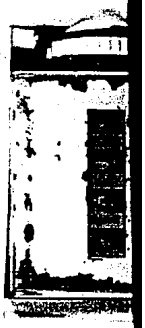

The new staff at Severnyy Polyus-5, while small, represents considerable polar experience. A. I. Sokolov completed his studies at the Higher Arctic Maritime School 8 years ago and is now a candidate for degree at the Arctic Scientific Research Institute.

I. M. Sharikov worked as a meteorologist on Severnyy Polyus-3 in 1954 and 1955, and aerologist G. M. Silin took part in the drift of Severnyy Polyus-4 the same year.(3)

When the new staff took over at Severnyy Polyus-5, they found the camp site heavily damaged by ice pressure and it was decided to move to a new location. Transfer of camp buildings, etc. was effected by using the tractor, and new supplies and equipment were delivered to the landing strip by Polar Aviation aircraft piloted by Titlov, Rudnev, and Mironenko. This material was moved from the air strip to the new camp site by the helicopter commanded by Koloshenko.(4)

Until mid-June, the station was drifting to the southwest, thereafter shifting to a south and southeast drift.(5) On 19 June, the station's coordinates were reported to be 86-25 N and 62-10 W (4), and on 4 July they were 85-39 N and 63-31 E.(5) Maximum drift speed in June was variously reported to be 12 kilometers per day (4) and 8 kilometers per day.(5)

G. Solov'yev, station doctor at Severnyy Polyus-5, recently removed the appendix of A. Gromchevskiy, helicopter navigator, in an entirely successful operation.(4)

A comparison of the scientific work done by Severnyy Polyus-5 in 1955 and 1956 and the work done during the drift of the Georgiy Sedov is of special interest. It has been found that conditions of atmospheric circulation in the Central Arctic in the winter 1955-1956 were different from conditions in the winter 1937-1938. In 1955 and 1956, the amplitude of temperature and air pressure variations was greater than in 1938 as well as the speed of winds. This was found to be particularly true in January and February.

In the 1955-1956 drift year, the oceanography group at Severnyy Polyus-5 completed over 320 deep-water hydrologic stations. Compared with vertical distribution of hydrologic elements as determined in 1937 and 1938 at the station Severnyy Polyus-1, the heat reserve of the Atlantic layer was found to be greater in 1955 and 1956.

Research on currents and ice drift was carried out at the station with the aid of highly sensitive, automatic self-recorders designed and built by the Arctic Institute. Throughout the drift, these instruments recorded current speeds and directions in the upper 1,000-meter level.(6)

The new drift station, Severnyy Polyus-6, is under the direction of Candidate of Geographic Sciences Konstantin Arsent'yevich Sychev, who has spent 20 years in arctic research while wintering at Yurogskiy Shar, Amderma, and Dikson. He has also worked on ships of the ice patrol and taken part in high-latitude expeditions. Recently he has been directing the arctic observatory at Bukhta Pevek.(3)

With the arrival of relief staffs at the drift stations, the polar workers from Severnyy Polyus-4 and Severnyy Polyus-5 returned to Moscow and Leningrad on 24 April. Those arriving in Moscow were brought by Polar Aviation aircraft piloted by V. Zadkov and N. Samseev. The group was welcomed on landing by I. Papanin and N. Zubov.

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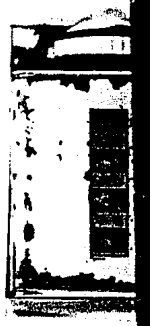

A meeting held to welcome the returnees was opened by V. Rumyantsev, chief of the Political Administration, Ministry of Maritime Fleet. V. Bakayev, Minister of Maritime Fleet; Academician D. Shcherbakov; and I. Papanin all spoke in welcoming the polar workers to the capital.

A large group of returnees was also transported to Leningrad in an aircraft piloted by I. Mazuruk. These men were met at the airport by members of the Arctic Institute, friends, correspondents, and others. A meeting at the aircraft was addressed by V. Frolov, director of the Arctic Institute.(7)

Automatic Drift Stations for Arctic Use

Alekseyev DARMS (drifting automatic radio meteorological station) have been used in the Arctic Basin during postwar years to report weather data 1,000 and more kilometers from the shore.

Recently, Alekseyev designed a new automatic station for transmitting weather data automatically. Once a day the clock mechanism on this device turns on instruments recording changes in air temperature, atmospheric pressure, and wind speed and direction.

The designer of this new equipment returned in May from the Arctic, where he established two of these stations on an ice field in the area of the North Pole with the aid of workers from the drifting station Severnyy Polyus-4 and a helicopter.

In the Arctic Institute, the first 15 meteorological reports from these new stations have already been received.(8)

Northern Sea Route Hydrographic Services

Until 1954, all the divisions of the hydrographic service were directly subordinate to the Hydrographic Administration of the Main Administration of the Northern Sea Route, which directed all complex work on the route, selected personnel for hydrographic ships, and handled ship repair, supply, financing, planning, and introduction of new technology.

In 1954 and 1955, three arctic regional administrations were organized along the Northern Sea Route: the Western (Ostrov Dikson), Central (Bukhta Tiksi), and Eastern (Bukhta Provideniya). According to the plan, these would consolidate all Glavsevmorput' organizations (including hydrographic) in a given region and would direct their activities, handle financial affairs, take care of personnel matters, and supply all material necessary for work in the Arctic.

Since 1952, the hydrographic ship Lot has been directed by the Pevek Patrol-Hydrographic Expedition, which was subordinate to the Hydrographic Administration of Glavsevmorput' until 1955. In this period, the plans for the ship and the expedition as a whole (including a second hydrographic ship, the Nerpa) were fulfilled and exceeded.

At present, the Pevek Patrol-Hydrographic Expedition is a part of the Provideniya Regional Administration which is subordinate to the Eastern Arctic Steamship Company and through it to Glavsevmorput'. The administrative apparatus and expenditures to maintain it have increased as a result of these and many other newly created degrees of subordination.

At the moment, the Pevek Patrol-Hydrographic Expedition is administered by the Provideniya Regional Administration, financed directly by Glavsevmorput'; operates on a plan and technical indexes developed by the Hydrographic

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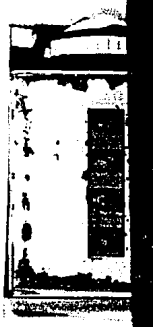

Administration; sends work for processing and receives scientific personnel from the Hydrographic Enterprise (sic); and is supplied with materiel and spare parts by Arktiksnab (Arctic Supply Administration) in Vladivostok. The Provideniya Regional Administration is supposed to supply ship personnel but is actually in no position to do so, since it has none available.

For maintaining and studying the Northern Sea Route in the area of the East Siberian Sea, one hydrographic ship is hardly enough; yet the Nerpa, after lying under repair for a while in Pevek, has been transferred to the Arkhangel'sk Hydrobase.

In 1955, the Lot exceeded its plan for marine measurement and patrol, but was unable to complete current repairs on navigational aids because of lack of time. And these aids were left unrepaired in 1954 for the same reason.(9)

A hydrographic expedition under the direction of Aleyev has returned to Dikson after carrying out a 3-month measurement program under difficult meteorological conditions. The members of the expedition, including Yerokhin, Misyun, Golovin, Tyuryumin, Gordeyev, and others, are now processing the collected material.(10)

Variations in Climate and Contemporary Warming

(Note: The following article on climatic variations was written by Prof S. P. Khromov.)

A great deal of study has been done on climatological variations in the geological past and numerous theories have been expressed on the reasons for these variations and the results of them. In this paper, however, we are not concerned with climatological variations in the geological past, but rather with the question of climatological variations during man's history, i.e., during a period of several thousand years, and the question of the absence or presence of climatological variation at present.

It is certainly not enough to state that climate is now changing, for the question remains as to the magnitude of these changes. It is possible that climate is now changing with the same speed as in former geological periods but we are not able to note these changes over a short historical period. In such a case, we would have to state that climate within the historical epoch is not changing or has not changed for all practical purposes. This would recognize that the changes were so small that it was impossible to differentiate them to any significant degree in comparison with yearly weather or climatic norms.

We must, therefore, develop methods for studying and detecting short-period climatic changes which occur within a historical epoch.

If over-all climatic changes are to be observed, observations must be carried out over a broad area and over a considerable length of time.

In the 20th Century we are approaching the ideal for meteorological observations; i.e., a network of meteorological stations throughout the territory of the earth. There is still, however, a great deal to be done. Meteorological stations are almost nonexistent in the Antarctic, and are still too few in the Arctic, northern Siberia, the interior regions of Asia, Australia, and throughout the oceans. And even in numerous places where these stations have been operating, they have still not completed observations over a sufficiently long period of time to be able to confirm or deny climatic variations.

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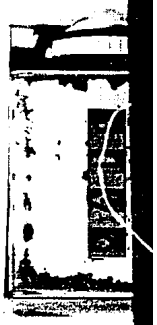

Observations for a period of 150 to 200 years in Europe and other continents are still few. Obviously this period is very short, but as we will see later this period of meteorological observations has brought us to interesting inferences.

Although regular meteorological observations by modern scientific standards were not received from the founding of modern cultures 1,000 and more years old, still some data may be gained from notebooks, literature, folklore, and other means which give some indication of changes of climate during the historical epoch. Sometimes they shed light not on the weather but on the condition of rivers, lakes, glaciers, and other attendant phenomena which are more or less closely related with weather and climate. However, it must be admitted that this data cannot be used too literally, for it is often not at all objective and usually rather selective

In spite of these difficulties, however, historical accounts have proved to be of tremendous interest. With their aid some indication has been given of the general climatic conditions in Europe and some other areas during the last thousands of years, and especially during the last thousand. It appears that after the quaternary glaciation period, for 5,000 to 2,000 years prior to our era, the climate in Europe was drier and warmer than in later times. Then, the climate became colder and wetter. Timber began to move out onto the steppe, tundra into the taiga, the level of water in lakes rose, and the concentration and extent of peat increased. This sub-Atlantic climate can be observed at present but with variations in both distribution and intensity. In the 11th to the 13th centuries, for example, the European climate, and apparently also the Asian, was mild and dry. The glaciers in the Alps, Norway, and Iceland were at the minimum distribution at this time, and in Greenland the Norwegian colonists successfully carried out stockbreeding. Then, in the 15th to 16th centuries, the climate again cooled and ice cover of the seas increased. From the 17th century to the middle of the 19th century, temperatures were comparatively low, precipitation was high, and glaciers were increasing. It was in this period that instrument meteorological observations began, which for the first time collected quantitative figures on European climate, and the magnitude of temperature, precipitation, etc. was taken and looked upon as a climatic norm.

In the 1870s, V. Koppen, the well-known climatologist, for the first time directed attention to the fact that the 11-year period of sunspots exerted an influence on temperature conditions of the earth. This connection was later studied by Nansen, Vize, and others. E. Brikner, the German geographer, in 1890 formed the hypothesis of the existence of a 35-year cycle in temperature and precipitation regimes in Europe from observations made during the period from 1700 to 1880 -- observations not only on weather but on the condition of lakes (in particular the Caspian Sea), rivers, glaciers, etc. According to the hypothesis of Brikner, every 35 years (in separate cases every 20 to 50 years) temperatures throughout the earth vary, dropping from some maximum and again returning to the maximum. The dimensions of these variations average 0.8 degrees. During the cold period there is an abundance of precipitation, but the warm periods have insufficient precipitation. These variations in precipitation in general amount to about 24 percent of the long-range average.

In 1907 and 1908, M. A. Bogolepov suggested a 33-year cycle for climatic changes, basing his suggestion on historical notes on the weather, especially using Russian chronicles. A similar 33-year period was discovered by Douglas according to the thickness of sequoia rings in California.

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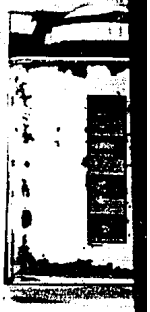

At present, however, the significance and veracity of the Brikner cycle appear to be doubtful. In the 20th Century it is certainly not apparant and regular, as was the case according to material gathered in past times.

Later research has indicated that there are other climatic cycles. In 1929 Koppen evolved a 45-year cycle of severe winter in Europe according to historical data from the 18th Century. Later he reaffirmed it with material on temperature observations from 1763. Many contemporary researchers suggest that in climatic phenomena there are cycles with periods in tens of years connected with phenomena in addition to the 11-year cycle of sunspots.

Now let us turn to our own time. During the recent decade we have noted contemporary climatic changes of even more interest since, for the first time in history, we may note these changes with sufficient precision. These climatic changes in a large area, probably over a large part of the earth, began around the 1870s, accelerated in the beginning of the 20th Century, and strengthened particularly in 1920. While some changes in the character of this alteration developed in the 1940s, these climatic changes did continue and are continuing. We have labeled these changes "a contemporary warming" since they are basically an increase in air temperature.

The first suggestions of contemporary warming were based on observations in the Arctic in the beginning of the 1920s. Occurrences in the Arctic in the 1920s and 1930s were so unusual that it was impossible not to note them.

In 1921, N. M. Knipovich for the first time drew attention to the warming of the waters in the Barents Sea, along the so-called Kola Profile (Razrez). For the period 1919-1928 the temperature of the upper sea water layers there averaged 1.8 degrees higher than for the years 1912-1918. Simultaneously, beginning around 1919 an increase in air temperature was noted at northern meteorological stations in Scandinavia and the USSR.

On Novaya Zemlya warming was very significant. In Malyye Karmakuly the mean yearly temperature for the years 1920-1935 was almost 2 degrees higher than for the years 1876-1919, and in March 1920, the mean temperature was almost 10 degrees higher than the long-range March average.

A less startling but all the same significant warming occurred along the shores of the White Sea. For the period 1916-1930 the mean yearly temperature there was 0.5-1 degree higher than for the preceding 20 years, and the mean temperature for November in Mezen' was 2.2 degrees higher. July, however, was cooler.

There are some who may feel that an increase in mean yearly temperature of one or 2 degrees is not significant. This is not, however, the case; for a mean temperature of many years' observation this is of significant magnitude. Over a long-range period, the mean yearly temperature in Arkhangel'sk is 1.3 degrees lower than in Vologda.

On the coast of Greenland the average monthly temperature of the aid for the period 1930-1938 was 4-6 degrees higher than the long-range norm, and on Spitsbergen the increase was 1.5-3 degrees.

In 1946 Ye. F. Rubinshteyn carried out systematic research on temperature variations in the Arctic and other parts of the northern hemisphere for the decades 1919-1928 and 1929-1938. This research showed that in the first decade there was a warming over the region from Novaya Zemlya to the western coast of Greenland. In the second decade, i.e., in the 1930s, warming occurred throughout the Arctic and especially high temperature increases were

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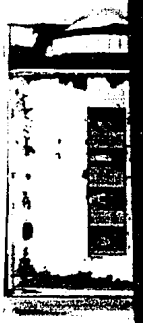

noted in Greenland and Spitsbergen. The most significant temperature increases occurred in the winter months. From 1910 through 1940 i.e., an average for the entire 30 years, air temperatures increased in Greenland more than 3 degrees, and on Spitsbergen and in northern Asia and North America by more than 2 degrees (according to the computations of the Danish meteorologist Lisgord).

Our knowledge of weather conditions in the Central Polar Basin for this period is rather scattered. However, observations on the Sedov in 1939 below 85 degrees northern latitude showed a higher temperature and less ice cover than observations on the Fram in 1894 below the 83d parallel of northern latitude.

Temperature increases are reflected in all weather and in navigation conditions in the Arctic seas. In Iceland in the last decade, ice disappeared from tillable land which 600 years ago had been cultivated but since that time had been covered with ice. On Spitsbergen, in Greenland, and in Alaska, sharp reduction in glaciers has been noted. The temperature of the waters in the ocean between Greenland and Norway has increased since the very beginning of this century, but these increases have been especially significant in the years 1930-1939. Ice cover of the Arctic seas has sharply decreased. From 1921 until 1930, in the Davis Strait ice cover was at a century minimum. In the summer of 1936, the ice cover along the shore of Greenland retreated to the 72d parallel of northern latitude -- a retreat greater than any within the memory of man. In 1925, a sailing schooner circumnavigated Spitsbergen, and in 1932 the Soviet oceanologist N. N. Zubov, aboard the 110-ton boat Knipovich, sailed around Zemlya Frantsa-Iosifa. In 1935, the icebreaker Sadko sailed through clear water from the northern extremity of Novaya Zemlya to Severnaya Zemlya and even further north to 82-41 northern latitude. The Proliv Yugorskiy Shar, in the period 1920-1937, froze on the average 2 months later than prior to 1920 (25 January in place of 24 November). The Severnaya Dvina River at Arkhangel'sk in the years 1916-1934 froze on the average 6 days later and opened 4 days earlier than in the years 1881-1915.

In connection with increasing water tempeartures in the Arctic during the 1930s, commercial fish began to appear off the coast of Greenland in larger quantities than earlier and some warm-water fish appeared for the first time. On Spitsbergen, the catching of cod and herring began. In the Barents Sea, warm-water fish also appeared in numbers which earlier were rarely or never seen.

In the White Sea, sea-perch appeared in 1927, while haddock and pollock appeared in 1931. Numbers of fish moved to the north in the Pacific Ocean also.

It is understandable that in the 1930s literature on climate began to include a new term, "warming of the Arctic." The tempo of this warming apparently slowed after 1940, but has still not ended. Mean temperatures continue to increase even now. The term "warming of the Arctic" is not completely true or representative, however, as a description of the climate of our time. After discovery of warming in the Arctic, research was increased on the century variation of temperatures for the temperate latitudes also. This research brought out a new, still more important discovery; namely, that the climate is warming not only in the Arctic, but also over a large part of the temperate latitudes.

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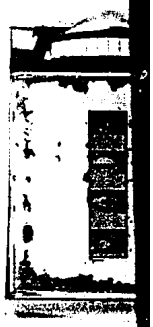

Ye. S. Rubinshteyn constructed a map of the temperature variations in the northern hemisphere using long-term means for two decades, 1919-1928 and 1929-1938. These were later augmented with a good deal of data for the southern hemisphere. The Rubinshteyn maps are extremely detailed and cannot be adequately surveyed here. It will suffice to say that it indicates some regions which during particular months show a cooling, however slight, in place of a warming. These regions lie primarily in Asia and in the southern hemisphere. Europe, on the other hand, especially northern and central Europe, belongs to the regions of warming, although not as strongly as in the Arctic. This warming appears to have begun in the second half of the 19th Century. According to the computations of Lisgord, temperatures both in the Arctic and in the temperatue zone of the northern hemisphere have increased continously during the last 100 years, more in winter and less in summer.

According to the research done by Rubinshteyn, a large part of the 19th Century (until the 1860s, and 1870s) was characterized in eastern Europe by pronounced temperature variations and there were several well-defined periods of cooling and warming. Warming was very significant in European Russia during the 1820s and 1830s. In Kiev, for example, the increase in temperatures was even higher than in our own time. After the 1870s and 1880s, the variations became less and a steady increase in temperatures was noted, especially in winter months. In the 1910s and 1920s, this growth increased sharply.

In recent long-term work, interesting details have been established on the route of climatic changes in Europe and other parts of the world during the last century.

Increased temperatures, especially winter temperatures, began in Europe, as we have already noted, in the 19th Century and accelerated thereafter. According to data gathered by Gelman for the city of Berlin (published in 1910), the mean temperature there for the period 1848-1907 exceeded by 0.3 degrees the temperatures recorded from 1756 to 1847. By 1920 the 10-year mean winter temperature in western Europe increased 2.5 degrees over that at the end of the 19th Century, and the yearly mean increased 0.5 degrees. Very mild winters were observed in Europe in the decade 1911-1920 -- earlier than the sharp increase in temperature in the Arctic. In Vienna the number of days with freezing temperatures has steadily decreased since 1905. Glaciers in Norway and in the Alps were retreating in the middle of the 19th Century. According to Rubinshteyn's data, the mean yearly temperatures for the period 1881-1915 were considerably higher than the yearly mean from 1846 to 1880. In Leningrad the mean yearly temperature for the period 1801-1860 was 3.5 degrees, and for the period 1921-1936 it was 4.6 degrees; i.e., for the century the temperature increased more than one degree, which would be equivalent to moving Leningrad to the south by 6 degrees latitude, or approximately to the latitude of Mogilev. It is not possible to explain this temperature increase as being attributable to the growth of the city, since the same picture can be gathered for Kronshtadt and for many other points in the European part of the USSR.

As already noted several times, warming is particularly apparent during winter months. The summer months during the same time may cool or warm to a lesser extent. Therefore, in the 19th Century in Europe the yearly amplitude of temperatures decreased; i.e., the continentality of the climate moderated.

In the 20th century, this development of maritime climate has continued and by the 1911-1920 period the amplitude had decreased to record dimensions. In Leningrad for the century the mean temperature decreased 1.3 degrees. The same was apparent for 150-200 kilometers from Leningrad to the west on the shore of the Gulf of Finland and in the direction of Helsinki.

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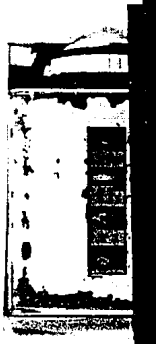

The extremely cold European winter of 1921 in no way changed the general tendency toward warming. But in the 1930s, in Sweden a significant lowering of winter temperature was observed and a lengthening of the ice season in the Baltic. By the end of the 1930s, warming of the winter months would appear to have ended in all of Europe. The 10-year mean winter temperature in western Europe for the period 1938-1948 was the lowest in the last 5 centuries. This phenomenon was contributed to by two extremely severe winters: 1939-1940 and 1941-1942. In later winters, mildness continued, and in addition to that a strong increase in summer temperatures began. Therefore, the yearly mean temperatures in general remained above norm in most recent times.

In the period 1931-1950, temperatures in the European sector of the Arctic and the North Sea area were 0.4 degrees higher than in the period 1901-1930. In Austria from 1943 to 1952, the mean temperature was higher than the norm for each individual year. For the entire 10-year period the mean yearly temperature in Vienna was one degree higher than the climatic norm. During the decade there were four summer droughts and in the fall of 1946 the snow line in the mountains was 1,000 meters higher than the norm. In the period 1949-1952 in Europe it was warmer than the period 1901-1930.

Temperature increases in the 20th Century have been observed in the US, in the prairies of Canada, and in South America. During the last century the Great Salt Lake has been reduced by almost half. There is information, however, that in the US temperatures since 1939 have dropped to the same degree that they had risen during the preceding 45 years. In India there is no indication of a general tendency toward either decrease or increase in temperatures, and in Australia, according to latest data, the temperature for the period 1911-1940 at interior stations decreased below that of the previous 30 years. The picture in Japan is not sufficiently clear, but since 1920 there has seemed to be a tendency toward increased summer temperatures there.

It is, however, impossible to state that the climatic conditions in our time are some sort of reorientation of temperature in which warming in one place is compensated by cooling in another. Since the 1920s, warming has been general over the earth and mean air temperatures for the world have increased as a whole. Air temperature increased in the period 1921-1930, and for the decade 1931-1940 the mean temperature throughout the world increased 0.1 degree over the preceding decade (according to data of the German meteorologist Rodewald).

Other elements of climate, especially precipitation, will not be discussed here. In general it may be noted that according to Ye. S. Rubinshteyn, the warming of the 1920s and later years has not produced corresponding reaction in precipitation during the winter months, at least between 60 and 20 degrees northern latitudes. In the summertime a significant fluctation has been observed, and as a result, changes in yearly precipitation at various latitudes and regions have been connected by some with temperature changes. In general, precipitation has increased during the period of warming.

Throughout the discussion of contemporary warming, we have spoken of increased mean temperatures, either yearly or seasonal, in comparison with climatic norms. This climatic norm is a long-range mean temperature computed or gathered over a long period of time. If the norms are lower than currently observed temperatures it indicates that they are based on observations from the cold period of the 19th Century. If norms were developed from observations beginning in the 1920s, they would be higher. Thus it develops that contemporary warming is warming in comparison with a previous cold period. Yet there is no basis for stating that the cold period was actually a norm for the world and that contemporary warming therefore is exceeding the norms. It could be considered quite the contrary, that contemporary warming is a return to a normal condition following the cold period of the 17th to 19th centuries, which marked the beginning of regular meteorological

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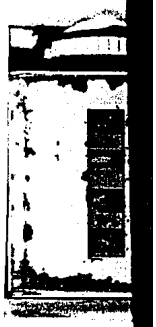

observations. It might also be said that contemporary warming is one of many in the history of the earth and is a more or less short-term climatic variation. It must be noted, however, that in the period of observation by instruments this is the first climatic variation of such dimensions.

But even with the contemporary status of meteorology, the very existance of a climatic variation, and especially its intensity, can be clarified to only a comparatively vague degree. The direct cause of contemporary heating, as for all general climatic variation with short periodicity, is the change in the character of general atmospheric circulation, one of the most powerful climate-forming processes. On this factor it might well be advantageous to concentrate research at this time.

At present there are two basic types of general atmospheric circulation in the extra tropical latitudes: the predominantly zonal circulation with prevailing westerly movement of air, and the predominantly meridianal circulation with vast displacements of air currents along the meridians carrying large masses of polar air to the lower latitutes and large masses of tropical air to the higher latitudes, Sometimes one or the other type of circulation is observed over all or almost all of a hemisphere, while in other periods one type is observed in one part of the hemisphere and another in another part.

Depending on the type of circulation prevailing, the distribution of atmospheric pressure is also affected. Thus, during a period of prevailing zonal circulation, the variation in pressure is increased between the lower and higher latitudes. The high pressure of the subtropical zone is increased, while the area of low pressure in the higher latitudes becomes stronger also. The westerly transfer of air becomes stronger, and the speed of movement of cyclones and anticyclones from west to east quickens. In periods when meridianal circulation is predominant, slow-moving severe cyclones and anticyclones form in the middle latitudes, blocking and backing up zonal transfer of air and bringing about heavy meridianal transfer.

In the course of a year the type of circulation may change frequently in different regions of the temperate latitudes, or it often happens that one or another type may last for some time. Statistical computations show that one type may predominate for an extremely long period, including years and even decades. It is natural to connect climatic variation with these changes in the character of atmospheric circulation.

In the 1930s, Sherkhag in Germany discovered that in the period 1921-1930 the areas of low pressure prevailing during the winter in the northern latitudes of the Atlantic and Pacific Oceans had deepened by almost 5 millibars in comparison with the long-range mean, while atmospheric pressure in the subtropical zone increased correspondingly. Thus the pressure differential between the subtropical and subpolar latitudes was increased, which resulted in a strengthened westerly carriage of wind. As a result, the flow of warm air masses from the temperate latitude oceans to the Artic increased, and was the direct cause of warming during the 1920s and 1930s. The earlier general warming of Europe and other regions may be explained in connection with analogous processes of the general atmospheric circulation. The question arises, however, as to the reason for these changes in the character of general circulation.

A precise answer to this question is not available. Variations in the intensity and changes in the character of atmospheric circulation apparently may begin under the influence of any one of a number of external factors leading to a variation of temperature between polar and tropical latitudes. This may be a change brought about by the influence of a volcanic eruption, while other changes may result from ocean currents, or in the state of ice cover (which in turn may be influenced by this same circulation), etc. The complex mechanism of general atmospheric circulation is certainly active in all changes in the

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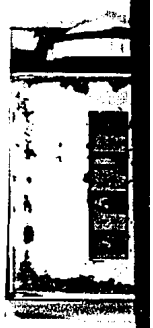

composition of the earth's surface, especially in the condition of ocean currents and ice cover. This connection is two-sided; i.e., each change in general circulation in its turn influences hydrologic (and sometimes geographic) factors, and these changes bring about new changes in circulation.

Many times the cycle of climatic change, actual or supposed, has been connected with the cycle (also actual or supposed) of forces reaching the earth from the cosmos and especially from the sun.

It is true that at present it is believed that the sun has remained constant or changed almost not at all for a period not only of historical time but also of geological time, and thus there have not been variations in the general flow of heat to the earth from the sun. However, there is undoubtedly a very significant variation, besides the periodic or rhythmical variation, in so-called solar activity -- in sunspot activity on the sun and in other processes observed on the surface of the sun. As a result of the variation in solar activity there is a variation in the flow to the earth of ultraviolet and corpuscular radiation from the sun. Therefore, the variations in solar activity are now considered as a primary reason for many changes in the higher layers of the earth's atmosphere and through these high layers as a reason also for changes in atmospheric circulation; i.e., in weather and climate on the surface of the earth. Soviet and foreign scientists (M. S. Eygenson, L. A. Vitel's, G. Villet, and others) have completed an entire series of research projects verifying these connections. It is noted also that it is possible to explain climatic changes by the cycle of solar activity.

In his time, Sherkhag connected contemporary warming with the 90-year cycle of solar activity the precise minimum in this cycle occurring at the beginning of the current century. Not long ago (1954), I. V. Maksimov made this more complex yet by superimposing two cycles. According to Maksimov, in the course of the last 3 centuries ice cover in the northern part of the Atlantic Ocean has undergone 60-80-year variations, reversing itself five times from 1570 to 1930. At the same time, according to the condition of ice on the shores of Iceland, another variation in ice cover can be determined with a period of about 250 years, occurring twice in 5 1/2 centuries. These cycles of ice cover have characteristics corresponding to cycles of climatic changes. In the first half of our century, the minimums of both the variation in ice cover and in climate (the 80-year and 250-year) coincided, which is reflected in contemporary warming.

The 80-year variation of climate of Maksimov is connected with the 80-90-year cycle of solar activity, and the 250-year variation is connected with the periodic changes in the speed of the earth's turning established in recent times. From the angular speed is developed the magnitude of the deviating force of the earth's turning (coriolis course) acting on atmospheric circulation. In the future, according to Maksimov, we may expect a reversal of the century climatic change toward an increase in ice cover in the northeastern Atlantic Ocean and a strengthening of the continentality of climate in Europe. Only the future can tell how accurate this prognosis is.

It should be realized that contemporary heating is not limited to the north Atlantic sector of the earth. As stated earlier, the period 1920-1940 was warmer on the average for the entire earth than the previous period, and in the decade 1931-1940 two thirds of the meteorological stations on the earth showed higher temperatures than for the preceding decade. Rodewald, in a 1953 work, indicated that such a general warming could be explained only by a positive heat balance of the earth; i.e., an increase in the flow of heat from the sun or a decrease in the radiation of heat from the earth.

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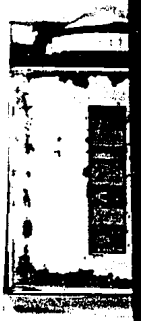

One other point should be noted. The mechanism of the atmosphere itself allows it to act as an independent force, both beginning a process and diminishing this process after some sort of maximum development has been reached. For example, a strengthening of atmospheric circulation as the result of an increase in interlatitudinal temperature differential permits an increase in the volume of warm and cold air exchanged between low and high latitudes, as a result of which the temperature differential is reduced and atmospheric circulation correspondingly decreases. The conversion of circulation from one type to another -- from zonal to meridianal and return -- is also explained by factors inherent in the very structure of atmospheric processes.

It was thought formerly that one or another hypothesis would in the end clarify all of the complexities of geological and historical changes in climate, including contemporary warming. We are convinced at present, however, that certain reasons for climatic changes do exist -- above all, the change in solar activity. But between a given suggestion on the reasons for climatic change and the changes themselves stand the intermediate mechanisms, the clarification of which is still an unsolved problem. Complete clarification of the problems of climate changes remains still in the distant scientific future.(11)

Distribution of Wild Reindeer in Kareliya

(Note: The following is an article by L. P. Nikoforov, Institute of Geography, Academy of Sciences USSR)

The wild northern reindeer (Rangifer Tarandus) is now found in only a few places in the European part of the USSR. The animals' distribution has been given only approximately in older studies and often quite inaccurately. Distribution reports on reindeer in the western half of the Karelo-Finnish SSR have been particularly inaccurate in the past.

In the works of K. F. Kessler, N. V. Turkin, and K. A. Satunin, it is indicated that up to the middle of the last century reindeer were found through almost all of the former Olonetskaya Guverniya (Province) in that part which corresponds to the present territory of the Karelo-Finnish SSR. Then the number of northern reindeer decreased and the area of this distribution was significantly reduced.

Works of later years indicated that reindeer were distributed only in the northern part of Kareliya with a southern boundary running either through Segozerskiy, Medvezh'yegorskiy, and the southern part of Pudozhskiy Rayon, or including the northern part of Suoyarvskiy Rayon. I. V. Druri, in his monograph written on the distribution of the reindeer in the republic, indicates that "south and west of the Vyg River the reindeer is almost never encountered."

L. P. Nikiforov, working with a party on fauna research in the western part of the Karelo-Finnish SSR, concluded, however, that such a description of reindeer distribution is inaccurate. Studying the fauna of Rugozerskiy, Kaleval'skiy, and Kesten'gskiy rayons, as well as utilizing information gained from questioning, this group composed a map of reindeer distribution significantly different from those published on the basis of previously acquired data.

The entire north, including Kesten'gskiy Rayon and almost half of Kaleval'skiy Rayon, are clear of wild reindeer. A line running through the Kuyto Lake system and south of the Ukhta-Kem' Road comprises the northern limits of reindeer distribution. The center of the area, established according to the place where reindeer are encountered in the greatest numbers and most regularly, is located around the eastern part of Nyuk Lake and includes a section of the Chirka-Kem' River and the area lying along it.

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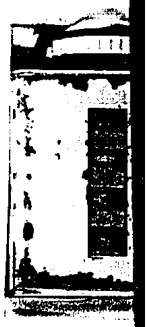

The sporadic distribution of reindeer and their movement during migration encompass a significantly broader area. In the north, reindeer reach the former timber points Pil'zano and Yuma, and in the west they reach the villages of Kostomuksha, Voknazolok, and Reboli. In the east they are encountered at several points in Tungudskiy Rayon and almost reach the line of the Kirov Railroad System at the stations of Kochkoma and Chernyy Porog. In the south the reindeer are encountered quite far and are noted in various places throughout Rugozerskiy Rayon, and in Segozerskiy Rayon and the northern parts of Petrovskiy and Suoyarzskiy rayons.

As a result, it may be concluded that at present wild reindeer do not inhabit the northern part of the Karelo-Finnish SSR, but are found in a comparatively limited area of central Kareliya. Heaviest concentrations are found in little settled and inaccessible places, such as found in the center of the distribution area. The southern, eastern, and western borders have been formed by a reduction in the originally broad area mainly through the action of man and civilization. In the formation of the northern border, the expansion of reindeer breeding in the northern part of the Karelo-Finnish republic has also forced the wild reindeer to the south.(12)

Kolkhoz Construction in Magadanskaya Oblast

In the far northern areas of the USSR, kolkhoz construction has always been a difficult matter. In addition to difficulties brought about by the climate, the matter is compounded by lack of local building materials (especially timber) and inadequate labor force. Local party and government organs have been aiding kolkhoz workers in construction problems by surveying for local construction materials and bringing in transport facilities and qualified workers.

With this aim, the Magadanstroy Trust (Magadan Construction Trust) of the Ministry of Urban and Rural Construction, RSFSR, has organized two special construction-assembly sections, one in Anadyr and the other in the area of Vostochnaya Tundra.

The construction-assembly sections have tractors, trucks, river and maritime cargo cutters, and construction machinery. These sections are doing 6 million rubles' worth of construction work in kolkhozes. During the past 2 years, 380 small wooden prefabricated houses have been brought in and assembled in kolkhozes.

Kolkhoz settlements in the area have changed greatly in appearance. The Lamuts in the kolkhoz imeni 1 May, for example, had been living in yarangs (huts) until recently. Then an officer, D'yachenko, was demobilized from the Soviet Army and was elected chairman of his artel, and the situation changed. In a short time dozens of Lamuts were taught construction trades and now operate as a permanent construction brigade. In less than a year, the brigade built a reading hut, a kolkhoz government building, a small hothouse, and a cow barn. The first six residential houses were recently occupied.

A variety of construction is being carried out at kolkhozes in Anadyrskiy Rayon. The workers at the agricultural artel "Kommunist" are being aided by workers from Bukhta Ugol'naya.

The Kolkhoz imeni Stalin has built a club and children's nursery. At the newly constructed wild animal farm there, the kolkhoz workers are breeding brown fox. In this agricultural artel, all workers live in wooden houses.

On Ostrov Vrangelya, the Chukchi and Eskimo kolkhoz workers are also being transferred to houses. At the kolkhoz "Vozrozhdeniye," there were still 99 yarangs and not a single house at the beginning of last year. Now there are dozens of wooden houses under construction there.(13)

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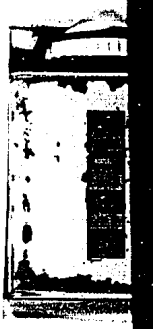

Industrial Expansion in Soviet North

In the northern regions of the USSR, new cellulose-paper plants are being built and existing ones expanded. One of the largest such combines is being built at full speed not far from Kotlas. About 3,000 young workers have been sent there.

A new iron ore enterprise, the Kovdorskiy Mine, is also being built on the Kola Peninsula.

In Noril'sk, a vast metallurgical combine has been built, including ore and coal mines, a concentrate mill, copper-nickel plants, etc. More funds will be expended in the expansion of this combine during the Sixth Five-Year Plan than during the last two 5-year plans combined. In the city, a plant of reinforced concrete construction is being built, and construction will soon begin on 540,000 square meters of living space, a television center, new motion-picture theaters, stores, restaurants, and other buildings.(14)

ANTARCTIC

A meeting of the Council on Antarctic Research (under the presidium of the Academy of Sciences USSR) was held in Moscow on 12 June under the chairmanship of D. I. Shcherbakov. This meeting reviewed the program of the Soviet Complex Antarctic Expedition for 1956 and 1957.

In the fall of 1956, a second large group of Soviet scientists will be transported to Mirnyy to relieve the wintering party there. This group will be headed by A. F. Treshnikov, who outlined the scientific program for the coming year to the members of the Moscow meeting. Continental work in the Antarctic will be expanded with the construction of the two interior bases Vostok and Sovetskaya, while marine work will continue aboard the Ob'.

The IGY scientific program was reviewed and discussed by V. F. Burkhanov, Ye. K. Fedorov, Ye. I. Tolstikov, Prof N. N. Zubov, A. A. Grigor'yev, V. V. Shuleykin, L. A. Zenkevich, and other scientists.(15)

Antarctic Expedition -- Continental Component

While under way for the Antarctic, members of the Soviet expedition had calculated that it would take 110 man-days to assemble a dwelling hut, but it took only 75-80 man-days. Construction of Mirnyy began on 14 February and concluded 16 March. During this period 49 living, scientific, and other buildings were completed. (16)

The completed camp contains six scientific pavilions (aerology, ionospheric studies, magnetology, meteorology, glaciology, and seismology) and laboratories for geophysics, glaciology, and geology (5)

During the construction of the camp, tractor operator Ivan Fedorovich Khmara was lost when his tractor broke through the ice.

Eighteen members of the construction group have remained with the wintering party at the Antarctic base camp.(16)

The Soviet tractor party, which left Mirnyy for an inland trip in the direction of the South Geomagnetic Pole, was met twice during their trip by aircraft flying from Mirnyy. At the 150-kilometer mark, they were met by an AN-2 aircraft piloted by A. Kash, and on 22 April, at a distance of 213 kilometers from Mirnyy, the party was met by an AN-2 and a LI-2 aircraft, which landed on a sastrugi-surfaced glacier.(17)

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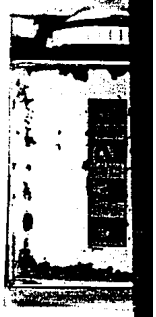

On 4 May, this party reached its deepest penetration into the interior, 370 kilometers. At this point, the aviation detachment under Cherevichnyy delivered construction materials and other supplies, and construction of the intermediate base Pionerskaya began at 69-44 S and 95-30 E. On 27 May, the station was opened, and six Soviet polar researchers were left to man it: A.Gusev, station chief; V. Babarykin, aerologist; A. Kapitsa, glaciologist; G. Malikov, radioman; N. Kudryashov, tractor operator; and P. Firsov, carpenter. (18)

It was reported on 23 June that the base camp Mirnyy had been receiving meteorological reports from Pionerskaya for 3 weeks. (19)

The continental component of the expedition includes an aerial photography group, which is using the AFA-TE aerial camera (Aerofotoapparat Topograficheskiy Elektricheskiy, Aerial Camera, Topographic, Electric). This equipment was built in the Central Scientific Research Institute of Geodesy, Aerial Photography, and Cartography by engineers S. P. Shokin and G. G. Gordon. It is composed of the most modern optical instruments with remote-control operation. Photographs are taken automatically according to a preset regime.

In addition, the expedition is using hand aerial cameras which take 50 photographs, 13 x 18 centimeters in size, at one loading. (24)

Scientific work in the Antarctic has included some interesting observations on solar radiation.

Radiation measurements in the Mirnyy area indicate that in the course of January alone, each square centimeter of horizontal surface received 16,000 calories of heat -- almost 15 percent more than in July around Leningrad and only 15 percent less than in the cotton fields around Tashkent. In the course of the entire antarctic summer (from December through February), each square centimeter at Mirnyy receives about 40,000 calories, which is almost the same as the area around Kiev or the Tsimlyanskaya Reservoir.

If all this heat were expended in thawing ice, each summer the thickness of the ice sheet would decrease 10 meters, and in 10-15 years would completely disappear in the Mirnyy area. Actually, of course, the snow-ice cover reflects an average of up to 75 percent of this heat in summer and about 100 percent in fall and winter. Only a small portion of the solar energy is absorbed by the surface of the mainland and converted to heat. Simultaneously, the mainland is giving up heat in the form of long-wave heat radiation at temperatures of up to plus 70 degrees.

Heat loss by radiation goes on around the clock, and in spite of the fact that the atmosphere returns part of this heat, long-wave radiation still accounts for 10-15 percent heat loss in addition to that lost through reflection of solar radiation.

The question naturally arises as to how the remaining 10-15 percent of the solar heat is expended in the Antarctic. Observations at several points along the coast of Antarctica indicate that this heat is expended in melting and evaporating snow and ice. On clear summer days, about 5 millimeters of moisture are evaporated in this area. The loss of heat in evaporation is great, however, and the amount of solar heat retained in the continent is not sufficient to carry it out; therefore, the continent "borrows" heat from air having a higher temperature than the ice and snow. For this reason, air temperatures remain low over Antarctica even during summer.

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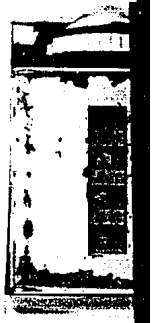

Considerable quantities of solar energy are absorbed by areas of the Antarctic which are free of snow and ice. Observations made during January at the oasis lying on the southeastern edge of the Shackleton Ice Shelf show that the dark surface reflected only 15 percent of all solar radiation. A large part of the radiant energy goes to heat the surface of the land and the air layer lying next to it. At noon, the temperature rose to plus 25 degrees there. Above the oasis, which covers about 500 square kilometers, a strong rising column of warm air exists. This rising air column forms cumulus clouds which were observed nowhere else in Antarctica.

All of these observations are applicable only to the summer period. During the long polar night occurring in the winter period (from mid-May to mid-September) the Antarctic continent receives no solar radiation, for all practical purposes. In one clear day in May or June, however, heat loss by radiation amounts to about 140-150 calories per square centimeter. With such heat loss, the surface layer of the ice is cooled 5-6 degrees hourly to a thickness of 1.5 centimeters. It can hardly be imagined how severe the climate would be in Antarctica were it not for the influx of warm air carried by cyclones from the surrounding seas. With the arrival of such air, temperatures increase rapidly.

Prof Aleksandr Gusev has reported from Pionerskaya that at the end of June the air temperature was minus 42 degrees. On 1 July, it dropped to minus 58 degrees, and during the night of 2 July it fell to minus 60 degrees. With each hour the temperature continued to drop, until at 1300 hours on 4 July it reached minus 64 degrees. This is the lowest temperature recorded in Antarctica. After 4 July, an influx of warm air from the Indian Ocean reversed the downward trend of air temperature. The same effect has been observed at Mirnyy, where a sudden calm has produced temperature drops of 10 degrees in 2 1/2 hours. (20)

(Photographs of the continental component of the expedition include the following: coastal unloading point for Mirnyy [Photo No 201632]; unloading LI-2 aircraft from Ob' [201635]; radio transmission station under construction at Mirnyy [201631]; electric power station under construction at Mirnyy [201634]; completed huts at Mirnyy [201630]; view of Mirnyy taken from the Lena [201633]; and low-altitude oblique aerial photograph of Mirnyy [201636].)

Antarctic Expedition -- Marine Component

During its first trip to the Antarctic, the expeditionary ship Ob' was under way for a total of 7 months and sailed some 33,000 miles. Scientific research was carried out during about 20,000 miles of this voyage.

Complex oceanographic research was executed along the coastal regions of eastern Antarctica in the sector between 91 and 162 degrees east longitude in the form of oceanographic cross sections from the Balleny Islands to New Zealand through the Tasman Sea and from Australia to the Davis Sea. On the last cross section, carried out in May, the Ob' approached within 120 miles of Mirnyy -- a record approach to this coast so late in the season.

From The Davis Sea, the expedition completed meridional oceanographic cross sections through the entire Indian Ocean. Deep-water research concluded on 8 June when the ship entered the Gulf of Aden after completing its 156th oceanographic station.

A great deal of the voyage made by the Ob' was under difficult navigational conditions. More than 4,000 miles were covered through ice and 1,040 miles in shallow water areas without navigational charts. The vessel's safe voyage can be attributed to the skill of Capt I. A. Man, Staff Captain A. F. Pinezhaninov, and hydrographers B. K. Zhukov and Yu. Ya. Chichkov.

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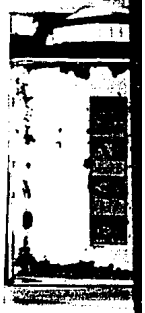

[One Soviet source (22) does note, however, that the Ob' was bilged while maneuvering in ice off Mirnyy. The damage, which was caused by submerged rocks, was sufficient to permit entry of water into the hold, and a diver was sent down to survey the hull. The source gave no indication, however, as to just how extensive hull damage was.]

Having completed work in the coastal waters of Antarctica, the expedition executed a broad program of oceanographic research in the southwestern part of the Pacific Ocean and in the Indian Ocean. This work was directed at studies on water and heat exchange between these oceans and antarctic seas.

A complex program on ocean bottom relief was carried out by the geological detachment aboard the Ob'. This group had more than 70 square meters of laboratory space aboard the ship, housing the very latest equipment: self-recording sonic depth finders, navigational instruments, an electroacoustical installation, complex separators for processing sea water samples, automatic filters, centrifuges, and microscopes.

Specially designed large volume bathometers, heavy equipment for taking bottom cores at any desired depth, the Okean bottom scoop (designed by A. P. Lisitsyn), and various types of core pipes were also at the group's disposal. Most of the equipment and research methods were developed by the Institute of Oceanology of the Academy of Sciences.

The geological group aboard the Ob' included A. Zhivago, A. Beresnev, V. Basov, P. Fominykh, and V. Shiporin, who gained considerable oceanographic and geologic experience aboard the Vityaz' in the Pacific Ocean.

The expedition aboard the Ob' found bottom relief in antarctic seas to be very unusual. Along the continental shelf, trenches and troughs up to 500-700 meters deep were encountered. These were caused by powerful glaciers at some time in the past, an explanation testified to by the presence of submarine moraine dating from the period of maximum shelf ice distribution in Antarctica.

A great number of bottom cores were taken by the geological group in antarctic seas and the southern part of the Pacific and Indian oceans. On the night of 12-13 May, a bottom core 14.5 meters long was taken off the coast of Antarctica at a depth of more than 3,000 meters, using a piston pipe designed by Engr A. Kudinov. This was a record length for the Antarctic, but the group also obtained numbers of cores 5-6 meters long.

When the Ob' sailed from the Davis Sea to the Gulf of Aden, a meridional oceanographic profile was taken across the Indian Ocean. This included 41 oceanographic stations in a distance of about 7,000 miles.

Meteorologists also collected interesting data during this run, using radiosonde for atmospheric studies. Radiosonde ascents averaged 18-20 kilometers. The data collected by this group supplements simultaneous observations made by meteorological stations on the same meridian on the Eurasian continent and in polar areas, thereby giving a complete picture of aerological structure in the lower layers of the atmosphere from the Antarctic (Mirnyy) to the Arctic (drift stations).

Biologists collected a great deal of material on fauna and flora in the Indian Ocean indicating the zonal distribution of life there and the degree of penetration by antarctic forms into northern waters. (21)

The marine and continental components of the expedition combined have collected more than 40 cases of zoological specimens for the Zoological Institute

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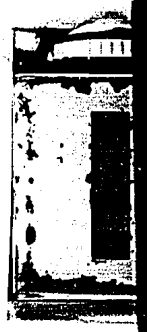

of the Academy of Sciences USSR. Sharks and penguins (including Emperor penguins) have been returned to the USSR frozen, and the institute has received more than 1,500 specimens of various fish and many types of birds.

Intense studies will be made on these collections at the Zoological Institute, after which they will be sent to the Zoological Museum of the Academy of of Sciences USSR and other Soviet museums.(22)

The staff of the marine component of the expedition serving aboard the Ob' comprised more than 50 scientists and specialists, including the following: Prof P. V. Ushakov, M. V. Klenova, A. P. Andriyashev, K. A. Brodskiy, A. P. Lisitsyn, A. V. Zhivago, A. G. Gaynanov, R. F. Usmanov, G. V. Rzheplinskiy, V. S. Nazarov, G. M. Belyayev, M. Ye. Vinogradov, V. A. Arsen'yev, K. V. Moroshkin, A. M. Bogoyavlenskiy, P. N. Fominykh, F. I. Ganpantsevov, and V. N. Ivanenkov. (21)

Crew Members of Expeditionary Ships

The crew of the expeditionary ship Ob' includes the following:

N. Konovalov, second electrical engineer
A. Podlesnomyy, fourth assistant engineer
I. Kostyuk and V. Syrovatskiy, electricians
V. Popov, engineman
K. Moshnikov, trawl master
F. Zherebtsov, N. Zherebtsov, and I. Korniyenko, radiomen
L. Yermokhin, fourth mate
V. Mitunov, seaman
N. Sviridov, second mate
V. Kaynov, third engineer
N. Padrukhin and N. Ogrutsov, senior enginemen
L. Gulyayev, senior diver (21)

The crew of the expeditionary ship Lena includes the following:

Vladimir Yevseychuk, engineman first class
Kirill Chubakov, chief mate
Aleksandr Yemel'yanov, Yegor Glazkin, Mikhail Shilkin,
Aleksandr Popov, and Ivan Tuchkov, seamen
Viktor Semenov and Leonid Bayborodin, engineman
Pavel Laptev, electrician
Valentin Pavlov, navigator
Anna Ivliyeva, buffet waitress
B. Dyatlev, chief radioman
V. Popov and A. Vlasov, radiomen (23)

Jurisdiction and Claims in Antarctic

(Note: The following appeared in a Soviet magazine for young people as part of a general discussion on the Antarctic and the Soviet expedition to that area.)

In 1908 the government of Great Britain, by a unilateral act, transferred the general Antarctic region to the administration of the Falkland Island governor. In the following years, a number of goverrments claimed territory in Antarctica with no sort of international conference being held. Norway, Australia, New Zealand, and France have all claimed sectors. The territory adjacent to South America is in dispute, being claimed by England, Chile, and Argentina.

The government of the US has included all of Antarctica in its so-called "Zone of American Continental Security"; that is, in the sphere of influence of

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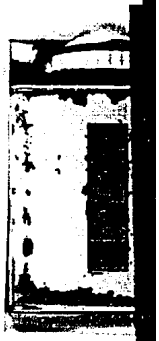

the US. Actually, Antarctica is a no-man's-land at present. The Soviet Union does not accept these unilateral actions which have divided territory in the Antarctic among capitalistic countries.

In a note of 27 January 1939, the Soviet government informed the Norwegian government that its unilateral action in annexing to Norway the Island of Peter I (discovered by a Russian expedition in 1921) was not recognized by the government of the USSR. The Soviet Union has never recognized these actions and reserves the right to take part in future decisions on the apportionment of territory in the Antarctic.

In 1945, at the conclusion of World War II, the question of organizing scientific research in the Antarctic was again raised. Soviet scientists decided to pursue systematic research there by organizing a permanently acting observatory. In December 1946, by decision of the Soviet government, the Antarctic whaling flotilla Slava was organized. In conjunction with the whaling activities of the flotilla, systematic scientific research work has been carried out.

Attempts by the US, Great Britain, France, Argentina, Chile, Australia, and New Zealand to decide the question of a regime for Antarctica without consulting the USSR have been met by legitimate protests on the part of the Soviet government.

On 7 June 1950, the government of the USSR sent a memorandum on the question of an Antarctica regime to the governments of the US, Great Britain, France, Norway, Australia, Argentina, and New Zealand. The Soviet government, noting the part played by Russian seamen in the discovery of Antarctica and in research in the area at the beginning of the 19th Century, stated that in accordance with international practice all interested countries must take part in deciding the regime of any area of international significance.

The government of the USSR cannot recognize any decisions taken without its participation, and on its part is prepared to review any suggestion by interested governments dealing with the question of a regime for the Antarctic. (24)

SOURCES

1. Moscow, Vodnyy Transport, 28 Jun 56
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3. Ibid., 5 Apr 56
4. Ibid., 19 Jun 56
5. Ibid., 5 Jul 56
6. Ibid., 21 Apr 56
7. Ibid., 26 Apr 56
8. Tashkent, Pravda Vostoka, 27 May 56
9. Vodnyy Transport, 19 May 56
10. Ibid., 5 Jun 56
11. Moscow, Priroda, No 1, Jan 56
12. Ibid., No 11, Nov 55
13. Moscow, Sel'skiy Stroitel', No 3, Mar 56
14. Moscow, Krasnaya Zvezda, 5 Jul 56
15. Vodnyy Transport, 14 Jun 56
16. Moscow, Stroitel'naya Gazeta, 17 Jun 56
17. Vodnyy Transport, 28 Apr 56
18. Ibid., 31 May 56
19. Ibid., 23 Jun 56

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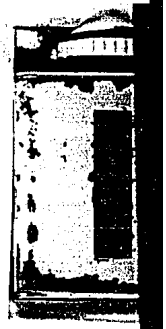

20. Moscow, Izvestiya, 21 Jul 56
21. Vodnyy Transport, 7 Jul 56
22. Ibid., 14 Jul 56
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